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THE ROLE AND FUNCTION OF RADIO, TELEVISION, FILM AND THE OTHER NEW MEDIA IN THE PERMANENT PROGRAM OF THE NATIONAL CULTURAL CENTER.

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IN 1958, CONGRESS AUTHORIZED A PERMANENT NATIONAL CENTER FOR THE PERFORMING ARTS. THE PURPOSE OF THIS REPORT IS TO ASSIST THE BOARD OF TRUSTEES OF THE CENTER IN DETERMINING POLICY WITH RESPECT TO EMPLOYMENT OF THE NEW MEDIA. A PARTICULAR GUIDELINE GIVEN THE STUDY WAS THAT THE PHYSICAL AND MECHANICAL ARRANGEMENTS NEEDED TO SERVICE THE MEDIA MUST NOT INTERFERE WITH THE ARTISTIC EXCELLENCE OF CENTER PROGRAMING. THUS, THE STUDY PROJECT EXAMINED RESEARCH AND DEVELOPMENT PLANS OF THE MAJOR COMMUNICATION EQUIPMENT COMPANIES TO DETERMINE WAYS AND MEANS OF MINIMIZING THE INTRUSION OF THE MEDIA ON THE CENTER'S PROGRAMING REQUIREMENTS. A CLOSE COLLABORATION WAS MAINTAINED DURING THE STUDY BETWEEN THE ARCHITECTS OF THE CENTER AND STUDY STAFF MEMBERS. THE REPORT PRESENTS POLICY RECOMMENDATIONS, POTENTIALS OF THE NEW MEDIA, PROGRAM RESOURCES, ARCHITECTURAL DESIGN FACTORS, AND EQUIPMENT AND STAFF CONSIDERATIONS. (JC)

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A Report Prepared Under
the Auspices of
The Telecommunications Center of
The Ohio State University
Columbus, Ohio

for

THE NATIONAL CULTURAL CENTER
Washington, D. C.

1963

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"The most important educational function of the Center will be its ability to influence American youth throughout the United States, particularly in the very early years. It ought to become some kind of a beacon which could light the cultural life of future citizens and make a love of the beautiful and appreciation of the aesthetic a natural and necessary part of their very existence."

--Robert W. Wagner

"If the National Cultural Center is to be truly national, then musical and dramatic productions--and the other presentations occurring in its halls--must be carried throughout this country--and to other countries--by the use of motion pictures, video tape and high fidelity radio and television systems, with special emphasis on new closed circuit and color television techniques."

--C. M. Jansky, Jr.

"Television (with its capacity to transmit both live and recorded performances of all kinds) . . . is a more important development for man than print. . . . If we look ahead 20 years to satellite delivery, memory storage, information handling and other systems that are now being developed, we can predict that any man on earth--at the push of a button and at the speed of light--will have access to the total of man's knowledge and can see everything of all our arts and cultures. . . ."

--Sylvester L. Weaver

MEDIA REVIEW PANEL

(Advisory Panel for the Project)

Agnes deMille, Author, Choreographer, Dancer. New York, N. Y.

Lawrence Dennis, Executive Associate and Director, Commission for Academic Affairs, American Council on Education. Washington, D. C.

Max Isenbergh, Deputy Assistant Secretary for Educational and Cultural Affairs, U. S. Department of State. Washington, D. C.

C. M. Jansky, Jr., Chairman of the Board, Jansky & Bailey Division, Atlantic Research Corporation. Washington, D. C.

Jarold A. Kieffer, Secretary, National Cultural Center. Washington, D. C.

William B. Levenson, Superintendent, Public Schools of Cleveland. Cleveland, Ohio.

Donald M. McGannon, President, Westinghouse Broadcasting Company. New York, N. Y.

Robert Saudek, President, Robert Saudek Associates. New York, N.Y.

Isaac Stern, Concert Violinist. New York, N. Y.

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FOREWORD

The role of the communications media in the permanent program of the National Cultural Center is being considered at the very time the United States is experiencing the greatest surge of cultural and educational development in its history, and at the time it is taking its greatest strides in communications technology.

In 1958, Congress authorized a permanent national center for the performing arts in order to advance our artistic, creative and cultural development and to make up for the lack of facilities in the national capital for the adequate presentation of symphony, opera, ballet, drama and certain civic events.

During 1962 the National Cultural Center commenced a study financed by the U. S. Office of Education, with the view to determining the relationship between the Center's programming and the growth in the use of television, radio and other media for both educational and entertainment purposes. While the Center's facilities are not intended to serve basically as broadcasting or film studios, nonetheless, the events which take place there will be of considerable interest to a wide public. Films and recordings of artists appearing at the Center can be used effectively in educational curricula at all scholastic levels. Video tapes, films and kinescopes of such performances can be shown to tourists during the non-active part of the day and great events can be televised for national broadcast and closed circuit network use.

Congress also intended the Center to be used both as a national performing arts center and as a place for civic and state occasions. The relationship between these two purposes can be especially close in the nation's

capital where artistic performances and official receptions and occasions can be usefully blended.

A particular guideline given the media study was that the physical and mechanical arrangements needed to service the media would not interfere with the artistic excellence of Center programming. To this end the study project has examined research and development plans of the major communications equipment companies to determine ways and means of minimizing the intrusion of the media on the programming requirements of the Center, and at the same time, of securing optimum results for non-resident audiences throughout the nation. There has been a close collaboration between the Center architects and the study staff to determine ways in which media requirements can be satisfied within the terms established by the Center for artistic excellence as well as cost and space limitations.

The project itself developed as a result of conversations begun in 1959 between Jarold A. Kieffer, Executive Director of the National Cultural Center, and representatives of the United States Office of Education. The actual study was conducted during 1962-63 by the Telecommunications Center of The Ohio State University whose Research Foundation served as sub-contractor for the National Cultural Center under a Title VII National Defense Education Act grant. The project staff feels a special debt of gratitude to members of the Media Advisory Panel appointed by Roger L. Stevens, Chairman of the Center's Board of Trustees; to the U. S. Office of Education whose New Media Branch and Cultural Affairs Branch staff members were particularly helpful; to Paige Donhauser and Max Engele of Edward Durrell Stone & Associates; to the administrative staff of the National Cultural Center and its director, Jarold A. Kieffer; whose continuing interest and assistance in this study has been invaluable.

The fundamental purpose of this report is to assist the Board of Trustees of the Center in determining policy with respect to employment of the

new media. It is also hoped other civic, cultural and educational centers may find the advice helpful.

We feel no enterprise whose public role will extend into the next century can afford to ignore the new dimensions in human experience which these film and electronic devices make possible. The new media of communication are not ends in themselves. Their purpose is not to limit, but to augment and extend human capacity.

Richard B. Hull, Project Director
Burton Paulu, Associate Director
Jack McBride, Field Supervisor

Columbus, Ohio, 1963

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POLICY RECOMMENDATIONS

While the recommendations which follow may be construed by the Board of Trustees to be a drastic departure from previous general plans, the experience of other performing centers in this country and overseas makes it quite clear a certain amount of filming, tape recording and broadcasting is inevitable. All indications point to an increased need and demand for such activities in the future.

The National Cultural Center should be designed to accommodate the new media without detracting from the appearance of the building or interfering with the audiences attending its performances. Space should be provided so that new media equipment could be installed as required on the basis of an orderly systematic plan which recognizes the minimum needs of the present, and anticipates the potentials of the future.

Auditoriums and stages should be designed for broadcasting, and provision made to cover events taking place in corridors and building approaches. Several small studios should be included in the design and arrangements made to convert one auditorium stage to a fair-sized studio.

The Center should have its own television, radio, film, recording, audio-visual and photographic equipment, and a resident staff of appropriate size to operate it.

While planning is in progress, there should be regular consultations between architects, experts in the new media, and specialists in the performing arts.

Those policies and procedures which depend upon architectural considerations should be determined before the Center is built since changes made afterward might involve expensive and possibly unsightly alterations.

Center Trustees now have an opportunity which will not occur again, to shape the future of a National Cultural Center which must be built for the next hundred years.

THE POTENTIALS OF THE NEW MEDIA FOR THE NATIONAL CULTURAL CENTER

If the National Cultural Center is to become a truly national development, spreading its influence throughout the United States and sharing its services with all of the people--not only those who visit or live in the nation's capital--the new media* of communications must play a fundamental role in Center planning, programming, and operations. By careful planning this tremendous potential can be realized under optimum conditions if events are recorded and distributed on film and video tape, transmitted by high fidelity closed circuit sound and video networks, and broadcast by radio and television stations. Modern technology makes it possible for Center performances to reach millions of people without impairing the enjoyment of the thousands who will attend National Cultural Center events in person.

The Communications Revolution

Auditoriums, theaters, schools and universities existed for centuries before two simple electronic devices, the telegraph and the telephone, emerged from creative scientific minds to initiate the modern revolution in communications. Then came the Atlantic cable, the vacuum tube, radio and the public address system, the iconoscope camera and television, the transistor, and now Telstar--all milestones in man's search for better and faster communication with his fellow men around the earth. What is more, still newer means of communication loom on the horizon.

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* The expressions "new media," "new educational media," and "electronic media" are used interchangeably in this report to include radio and television (broadcast and closed circuit, live and recorded); all types of recordings (film, kinescope, tape and disc) and related audio-visual resources, electronic and non-electronic.

At present the American public is served by more than 3,700 AM, 1,000 FM, and 600 television stations, with more planned and under construction. Our major commercial broadcasting networks (four radio and three television systems) blanket the entire nation, bring programs to 95% of American homes with radio and 90% with television receivers. Films, tape recordings and phonograph records are examples of other audio-visual media which have become widespread as a result of this communications revolution. In addition, a number of commercial closed circuit systems can distribute live or recorded programs in black and white or color.

During the next three to five years, new techniques in closed circuit television are expected to make possible large screen presentation in full color as good or better in quality than the Cinemascope, Todd American Optical or Cinerama picture systems together with high fidelity and stereophonic sound. Such systems could interconnect hundreds of auditoriums and theaters in cities and on college and university campuses.

Education and the New Media

Ever since the early 1920's education has made extensive use of the electronic media. America's major cities now are served by some 79 educational television and over 200 educational radio stations, most of which are closely associated with school systems, colleges, universities, and other cultural agencies. A video tape network links most of these television stations, with live interconnection an early goal. One tape and one live network serve the educational radio stations. These stations and networks devote a major portion of their time to cultural and public affairs presentations.

More than 600 educationally-owned closed circuit television systems are now in operation with hundreds more in prospect. These CCTV systems range in size from an installation designed to serve one room in a single school building

to campus-wide, city-wide and even state-wide multi-channel installations with studios, professional cameras, and in some cases, color television equipment. A number of specialized CCTV systems are employed for instructional and observational purposes in schools of chemistry, dentistry and medicine. There is increasing interest in similar systems equipped with high-fidelity color and sound for use in schools of fine arts and music.

Indicative of this growing interest in the new media on the part of formal education is a recent experimental development underwritten by the Ford Foundation and based at Purdue University. The Midwest Program for Airborne Television Instruction, using two UHF television transmitters housed in a DC6-AB aircraft which circles 23,000 feet above Montpelier, Indiana, beams instructional programs to various public school systems and college campuses within a six state area.

Even before radio broadcasting had become general, the United States assumed educational leadership in photography and the audio-visual arts. There exists a wide spectrum of applications including new forms in the motion picture, new projection methods such as Cinerama or Cinemascope, new filming and projection techniques in the 16 and 8 millimeter motion picture field, a variety of creatively designed exhibits involving concepts like the "visual wall." All of these offer potential for the editing, translation, packaging and distribution of cultural and educational materials which otherwise, for economic reasons, would not reach key audiences,especially young people at home and abroad. Audio-visual departments in hundreds of school and universities provide projectors for still and motion picture reproduction, monaural and stereo high fidelity sound systems.

In varying degrees, therefore, American education has already equipped itself with these new media and--even more significantly--is acquiring these

devices and increasing the scope of their application at a constantly increasing rate.

The New Media Abroad

Nearly every foreign country now has its radio service, and more than seventy have television. The United States Information Agency reported that in 1962 the number of television stations in the world (excluding the United States, its armed forces stations and Canada) increased more than 29% to more than 2600, while the number of television receivers with a 21% increase grew to more than 65,000,000.

Television's most spectacular growth during 1962 was in Japan making that country second only to the United States and slightly ahead of the United Kingdom. The total for the entire communist bloc was only 11,010,000.

In foreign countries where broadcasting is more directly under government auspices than here, greater emphasis is placed on educational and cultural programming. The significance of this in terms of cultural exchange is obvious.

The National Cultural Center as a Truly National Institution

The rapid development of these improved means of communication found the performing arts and education dependent upon physical structures which were designed without respect to this new technology and its potential solutions to the basic problem of bringing education and culture to more and more persons.

Originally, an auditorium provided the means whereby large numbers of people could gather in one place to see and hear performances. With the advent of the motion picture, radio, television and recording devices, however, the very concept of a group gathered to "hear" and "see" has changed. Modern communications technology can serve millions in their homes as well as in schools and colleges. The voice, image and message of the artist and educator

can be electronically amplified, duplicated, and distributed to the nation and to the world.

The National Cultural Center could be regarded as a superb auditorium in the classical sense, a place in our national capital for the presentation of opera, ballet, music and drama. As such, it would symbolize and demonstrate the interest of the United States government in the performing arts as a basic part of our heritage, and it would stimulate new interest and activity in these arts throughout the country.

But through the new media, the National Cultural Center could become a truly national institution. Appropriate planning would enable national and international distribution of Center materials instantaneously by radio and television broadcast or closed circuit, or on a delayed basis by film and other types of recordings, without impairing presentations to the audiences which will assemble in the Center to attend plays, concerts, opera, ballet, and other performances.

Specifically, these new media could be used to:

1. Extend the influence and bring the resources of the Center to the entire nation.

2. Arouse interest in the Center so that the public would better understand its work and would be stimulated to take part in its activities either through attendance in Washington or through reception from the new media in all parts of the country.

3. Provide an additional dimension for the Center's international activities.

4. Improve the work done within the Center through closed circuit television, radio, film and recordings of all types.

<u>If the National Cultural Center is to be truly national in scope, it must be designed and equipped so that the new media can bring its resources to the United States and to the world. This can be most effectively and efficiently done if these media are made an integral part of all Center planning and operation from the very outset.</u>

PROGRAM RESOURCES, ACTIVITIES AND POLICY CONSIDERATIONS

As a presentation house, the National Cultural Center will have the finest artists of America and the world appearing on its stages in performances of classical and contemporary music, opera, drama and the dance. The Center, also charged with the presentation of lectures, the development of programs in the arts for the education of all age groups, and the provision of facilities for civic activities, will have an unparalleled resource of talent reflecting many facets of our culture.

Through the new media these talents can be shared at only slight additional cost with millions of people in the United States and throughout the world. There could be instantaneous broadcast and closed circuit transmission of all types of Center events. There could be visual and aural recording on disc, film and magnetic tape for delayed transmission and for replay within the Center itself; for package circulation to the public schools, schools of music and music stores; and for the archives. There would be additional opportunities for special broadcasts, motion picture productions and recordings of works commissioned and of performances scheduled especially for the new media.

Broadcasts of Artistic Events

Since there will be concerts by some of the world's outstanding symphony orchestras, solo artists and smaller instrumental groups, as well as outstanding operatic, dramatic and ballet presentations, the Center will be a tremendous program source, providing material for many broadcasts as well as for national

closed circuit distribution*, an application whose special utility for the Center may well outstrip many other distribution techniques in the future.

At the same time that extensive broadcasting is envisaged from the Center it is only fair to observe that it is not realistic to think in terms of the daily use of these programs by radio and television stations, with the possible exception of a few "good music" and educational stations specializing in this kind of material. The percentage of commercial broadcast time devoted to the arts is limited, and the millennium will not arrive on the day the National Cultural Center is completed. Realistically, commercial broadcasters would be interested in pickups from the Center to the same extent they now are in broadcasts from Carnegie Hall, Lincoln Center and the Metropolitan Opera House. It should also be noted that Center policy, because of concern over ticket sales, may preclude some broadcasting and that managerial, union and copyright restrictions may impose limitations, too.

These performances will be equivalent to what is now offered by Carnegie Hall, Lincoln Center and the Metropolitan Opera; they will parallel the resources of Covent Garden, Bayreuth and the Vienna Opera; and they will match the studio recitals of the British Broadcasting Corporation and the best in American radio and television. This resource should be shared with the nation and the world.

Recording by Commercial Companies

Commercial recording activities should constitute an important extension of the Center's work. Since it may be expected that Center auditoriums will

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* Pending technological developments in high fidelity sound, picture, color and large screen projection for closed circuit television transmission offer unique opportunities for the Center. Concert and theater audiences could see and hear productions from the nation's capital. Both the quality and quantity of fare offered on the traditional university concert and lecture series could be greatly augmented by such transmissions. In both situations there exists an economic potential of support not possible under conventional open-air broadcasting practices.

have outstanding acoustics, various organizations whether or not appearing there might wish to make recordings in the National Cultural Center for distribution through commercial channels. In addition, many broadcasts would be from recordings delayed from a few hours to some months. These would be of particular interest to broadcast and closed circuit networks and independent stations, both in the United States and abroad, which could not interconnect with the Center for live broadcasts.

Commercial groups and Center staff could jointly and independently develop package programs for broadcast, study and library use. These might consist of edited versions of live performances, recordings made especially for such purposes, or some combination of these. Not only could conventional materials be circulated in this way, but offerings of artistic value but limited commercial potential could thus be made available, especially if the Center were equipped with its own recording facilities. For example, such State Department cultural exchange projects as a dance group from India, a folk singer from Spain, or a poet from England might be of great interest to educational institutions in this country as well as to educational and broadcasting organizations in their native lands.

The National Cultural Center and Education

The Center will have unique values to offer to our very young people as well as those in secondary schools, colleges, and to adults--programs of formal or informal continuing education. New and perhaps revolutionary studies are now going on showing the importance of early exposure to cultural and educational influences. Conceivably children's theater art, literature and music could play a key role in the future program of the Center. At the present time, one of the basic problems which faces every educational institution on every level engaged

in any way with instruction in the dance, fine arts, the humanities, music, music appreciation and the theater, is a dearth of appropriate illustrative material. While this lack is perhaps most marked in the available supply of TV and filmed material, the educational need is crucial in each of these areas of artistic endeavor.

Educational institutions could make extensive use of Center recordings of all kinds, particularly those of unique character and permanent historical value. Education certainly would be involved in the creation of new works for the electronic and audio-visual material as well as in training projects. Typical of the variety and scope of uses in American education to which these materials might well be applied are:

1. Recorded distribution of representative NCC concerts and opera performances for instructional use by schools of music and drama.

2. Closed circuit network presentations of NCC performances as special concert series for students and faculty assembled before large screen television sets in student unions and campus auditoriums throughout America.

3. Recorded adaptations of NCC artists' performances by the National Educational Television and Radio Center for broadcast in prime evening hours by the nation's 79 educational television stations.

4. Distribution by the National Association of Educational Broadcasters of NCC symphony concerts recorded in their entirety for uninterrupted broadcast over non-commercial radio stations.

5. Distribution by the National Educational Television and Radio Center over local educational television stations, of interviews with distinguished artists performing at the NCC, recorded for use in a music appreciation series.

6. Music courses featuring an artist such as Isaac Stern produced in the NCC studios and distributed by the Great Plains Regional Instructional Television Library for in-class viewing by junior high schools.

7. Distribution under NCC control by a regional educational network of a special performance by regional talent appearing at the Center.

8. Distribution of NCC performance archival materials for graduate student use in music and drama research studies.

9. Live broadcast reporting a special Heads-of-State reception beamed to homes in the eastern section of the United States through the facilities of the Eastern Educational Network.

10. NCC contract production with the USIA or the Peace Corps of performances by American artists or by visiting artists for use over the rapidly expanding broadcast facilities of newly emerging nations.

These examples suggest at some point the Center should undertake to provide systematic audio-visual services for formal education based on the needs of school systems, colleges and universities. Such an endeavor would involve careful study of the best methods of distributing audio-visual materials of all kinds and placing such services on a self-sustaining economic basis. Careful thinking about storage and reproduction systems involving magnetic tape, 8mm, 16mm and 35mm film would be required. Pursuit of this endeavor would be directly linked to a Center archival function (whose activation might logically precede the former) since many Center presentations of the performing arts and public events of several kinds will have permanent historical interest. Insofar as copyright and union regulations permit, a substantial number of these events should be recorded for school and college use, for storage and future reference in a repository of historically significant material, or for distribution by such newly-established national and regional libraries as the National Instructional Television Library, the Northeastern Instructional Television Library, and the Great Plains Instructional Television Library.

Training in the New Media

The Center should develop training projects for advanced students interested in learning the special techniques involved in producing materials for the new media. An appropriate staff would include experts in this kind of writing, scoring, staging and producing for broadcasting and recording who could organize

workshops and institutes to which national and international teachers and students would be attracted.

Commissioning New Works for the Media

In addition to transmitting art works designed for stage presentations, these media also should be regarded as subjects or instruments in themselves which provide a new environment for which new works could be especially created. For that reason the Center, working alone or in cooperation with schools, colleges, conservatories and foundations, should encourage the creation of musical, literary, dramatic and dance compositions designed especially to explore the unique potentials and to meet the special audience requirements of the new media. The results could be broadcast, filmed, and/or recorded for national and international distribution.

New Media Uses within the Center Itself

There should be film projection, video tape projection, closed circuit television, and sound systems within the Center. Not only should television be available (as at Bayreuth, for example) to relay the conductor's beat to off-stage choruses, but also to permit observation and study of rehearsals and performances by participants and staff, to transmit performances to other parts of the Center when overflow facilities are required, and to facilitate security surveillance when chiefs of state are present. The accompanying projection facilities also could be used to play video tape and film recordings of previous Center events to visitors and sightseers.

Such facilities would permit input of cultural programs and information via electronic and photographic connections from other centers throughout the country such as Eastman House in Rochester, the Museum of Modern Art, the United Nations, and the developing Hollywood Museum. In this sense, the Center could

draw upon and, to some extent, pull together some of the work of these other centers in a way which would amplify the U. S. cultural image domestically and overseas.

Policy Considerations

In implementing such endeavors, the National Cultural Center should follow a policy of cooperation rather than of competition. Its work should be planned to supplement rather than duplicate or overlap the output of networks, stations, recording companies, educational organizations, government agencies and other groups working in the same fields. Consequently, there should be frequent consultation between the Center staff and representatives of related groups to plan a coordinated approach.

The National Cultural Center should not become permanently allied as to either equipment or staff with any one network, station or recording company. To do so would bring special advantages to the organization concerned, making it difficult for the Center to maintain its status as a truly national institution, treating impartially all the groups with which it became involved. This policy, among other things, would exclude close permanent relationships with any single Washington broadcasting organization.

Congress intended the National Cultural Center to be a performing arts center and a place for civic occasions, not a broadcast or film studio. However, the Center, through judicious use of radio, television, film and other new media, can, at relatively low cost, transcend geographical limitations and extend its influence, thus undergirding its development as an institution which is truly national.

ARCHITECTURAL DESIGN FACTORS AND THE NEW MEDIA

It is essential that the National Cultural Center be designed so as to accommodate the new media efficiently and economically, without detracting from the appearance of the building or interfering with the audiences attending its performances. However, at the same time and within the limits of the practical and possible, the design objective should be to provide optimal conditions for their employment in the Center program.

Therefore, from the outset, those decisions which affect the allocation of space, the installation, operation and staffing of the new media are of great importance, not only to the future administrators of the Center, but to any broadcasting, film or recording enterprise which may undertake to operate within these new facilities. These considerations will prevail whether the Center finally contemplates:

1. Only occasional broadcasting, filming and recording from each of its three major halls and reception areas.

2. Use of the media within the Center itself for operational and archival purposes.

3. A regular pattern of program origination and distribution.

4. Special creative and experimental production utilizing the media as art forms in themselves.

Whatever the immediate decision of the program advisory group and the Trustees, it would seem wise to provide interior building designs which are flexible and which may later be modified at minimum cost to permit any or all of these operations to take place.

Undoubtedly, the changing shape of our society will and should play a considerable role in long term Center programming and facilities planning. Much of the upsurge of cultural interest in the United States can be attributed to

the wider national dissemination of the ballet, the opera and the symphony through film, radio and television outlets and through phonograph records and tape recording machines. The population explosion, automation and the "new leisure" are creating new problems and new opportunities for those who attempt to serve hitherto non-existent audiences whose needs and desires for continuing education will increasingly embrace the arts as well as science and technology.

Need for New Designs

The architecture and artifacts of business, industry and the military--all successful beneficiaries of the machine age--reflect a change from hand labor techniques, first to a mechanical and now to an electronic technology. Meanwhile, education and the performing arts operate for the most part in an older tradition, trapped in physical structures conceived and constructed without respect to the new instruments of communication. Like cities, these structures were built before the automobile, the airplane, radio and television. In education there has been surprisingly little change in the functional design of school buildings. Although there have been great improvements in construction materials, space arrangements, heating and cooling systems, and lighting, the basic concept of a school building as an extended series of self-contained classrooms still prevails. Likewise, new structures designed for the performing arts, despite some striking innovations in acoustic control systems and the like, tend to represent refinements rather than basic changes in the concepts which underlay the construction of opera houses and concert halls of one or two centuries ago.

New developments in audio, video and film technology now make it possible to incorporate these devices into architectural planning in such a manner that the resultant structure can belong to any period and audiences for the performing arts can be served in the conventional way, while at the same

time the event can be recorded or instantaneously transmitted electronically to hundreds of other audiences. It therefore becomes feasible for the Center to plan to meet the needs, not only of the thousands who will personally appear there to use its facilities, but the millions whose only contact with the Center will come through the electronic and film media.

Buildings Modified or Designed for New Media

From the standpoint of the new media, buildings can be classified as: (1) those designed without reference to the electronic media; (2) those designed for use by live audiences but with the new media as a regular extension of their services; and (3) those designed as sources of a regular and systematic programming service for the new media.

Carnegie Hall, built half a century ago, falls into the first category. Fortunately, it lent itself well to radio and recording because it had excellent acoustics although the introduction of microphones was difficult involving some unsightly installations. But Carnegie Hall proved much less suitable for television for which reason changes are planned for its stage.

Lincoln Center and the United Nations buildings, on the other hand, are examples of category two. Lincoln Center, though designed primarily for those who come to its auditoriums, has made provision for the use of the media on an occasional basis. The United Nations went a step further since its designers planned for a regular program service. Not only was space provided for cameras, microphones and control rooms, but in addition, the equipment itself was permanently installed.

United Nations equipment includes, in addition to installations in the most important meeting rooms, five small radio studios (now partially converted for television interview-type programs), and two small radio talk studios. The

equipment generally is extensive, but financial limitations which made it impossible to acquire video tape recorders, sharply limit the UN potential for television programming.

Perhaps the radio and television installations of the British Broadcasting Corporation provide the best examples of the third category, a specialized studio environment designed at the outset to provide optimum conditions for the origination of radio and television broadcasting and recording. Broadcasting House is equipped to originate and record all kinds of radio programs from talks and new broadcasts to variety shows, drama, opera and symphony concerts.

The BBC Television Center is one of the most remarkable structures in existence with a completely controlled environment for the staging of any type of performance in any of the performing arts. Now operative for several years, it may be said to be in a continuous state of planning and modification. As a matter of policy, a permanent team of architects, engineers and program and production experts constantly review the use of the buildings, meet emergent needs, and plan future modifications and additions.

A guiding factor in this flexible approach derives from the special limitations and advantages of the media themselves. The conventions of the ballet, the legitimate theater, the opera and the symphony at the present time call upon the new media primarily in terms of simulating a theatrical reality with which patrons of the arts are already familiar. Exploration of film and television as media which themselves offer new creative environments for the performing arts have been limited and confined thus far primarily to variations on the conventional operatic stage presentation and to new developments in the dance.

A dual facility at the Center based on the present Edward Durrell Stone plans could provide a limited production environment for film and television comparable to one of the BBC-TV studios. One of the three auditoriums should be planned and constructed as a convertible stage whose outward appearance and normal useage would be completely conventional but which could be transformed immediately into a specialized television studio for use during periods when artists were not rehearsing or performing for regular presentations to audiences.

BUILDING DESIGN, NEW MEDIA EQUIPMENT, AND STAFF

The new media of communication are not ends in themselves. They are simply "extendors" and "multipliers" of the sensory apparatus and the creative processes of the human being. Their purpose is not to limit but to amplify and extend human capacity and to transcend some of the barriers of time and space.

No enterprise whose public role will extend into the next century can afford to ignore the new dimensions in human experience which these electronic and film devices make possible. The Center must build for the next hundred years.

Therefore, the National Cultural Center should be designed to permit optimum use of the new media in carrying out its objectives, without detracting from the appearance of the building or interfering with the audiences who will come to its auditoriums.

Such an outcome can take place only if the new media facilities and functions are conceived as an integral part of Center design and planning from the outset.

Opportunity for Decision

The Trustees now have an opportunity--one which will not be repeated--to insure such an outcome, to avoid future difficulties, and to save a great deal of money as well. Policy decisions need to be made now which will permit architects and electronic specialists to plan for the communications problems which the Center will almost inevitably face in the future.

While initial Center involvements with the new media may be modest--confined to occasional broadcasts or filmings of performances by outside

organizations, once the space assignments and technical requirements have been made to meet this level of activity, the basic conditions for several more complex levels of activity, if desired in the future, will have been established.

Failure to make basic policy decisions on the role of the media, leaving these problems to be dealt with later on a case by case basis, can result in enormous future costs and results less than satisfactory.

Equipment Considerations

The Center can follow either of two procedures with respect to equipment. Like Lincoln Center, it can provide (a) cables, space for control rooms and cameras and rely on portable equipment brought in on an occasional basis by broadcasting and recording companies; or (b) like the United Nations it can maintain ownership and control by installing its own television, radio, film and recording equipment. The latter procedure is recommended for several reasons:

1. The Center would be independent of outside broadcasting and recording groups and hence be free to: (a) record significant performances which might have little commercial value; (b) use the facilities to enhance the interior program of the Center including the archival function; (c) realize revenue from the rental of equipment and program origination for networks.

2. The presence of equipment should encourage broadcasters and recording companies to utilize Center program resources since it would both serve their convenience and reduce their cost.

Regardless of the level of sophistication which new media development at the Center may finally assume, any permanent equipment should be of the latest design and meet the highest technical standards. Provision must be made for both monochrome and color television origination. The spatial areas assigned to and constructed for these devices must permit ready modification or replacement of equipment as new technological developments occur.

Some attention should be given to electronic and film standards in European and other countries in the design and selection of equipment--and to methods of film distribution which might transcend that need. Careful attention should be given to the integration of electronic and non-electronic equipment in the assignment of space and the planning of programs.

Finally, Center planners should make every effort to benefit from the experiences of similar developments such as Lincoln Center from the experiences of the national television and radio networks and from film producers and audio-visual specialists.*

A Systematic Plan for Center Media Development

If the concept of "A National Cultural Center" matures in its broadest sense and is not limited to transmission of the "performing arts"--theatre, opera, ballet and symphony--but is also conceived to include the fine and graphic arts, the motion picture and other cultural expressions as a necessary enrichment of the Center's program, both internal and transmitted, careful consideration of the use of all the new media is essential.

From this point of view, policy makers can plan Center involvement with the new media on what might be called five successive levels of sophistication. These five phases of development would provide the Center a capability ranging from (1) minimum and occasional use to (2) maximum, regular and frequent use of film, radio, television and other audio-visual facilities.

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* Retention of an experienced firm of television engineering and design consultants would be a desirable first step as would appointment of a permanent advisory committee on the new media, who could work with the Center staff on a continuing basis. Such a committee might well include the engineering vice presidents from the three major television networks, representatives from the National Educational Television and Radio Center, the National Association of Educational Broadcasters, and the Division of Audio-Visual Education (DAVI) of the National Education Association.

While each of the five phases would represent an increased cost outlay for capital equipment and construction--and while Phase V calls for substantial staff and operating as well as capital funds, the total space requirements for all five phases involve only 12,446 square feet or approximately 3% of the total floor space of one floor of the Center. (Phase IV which calls for modification of the stage in one of the Center's three halls for dual purpose use does not require additional space, but rather different treatment of space already planned and allocated.)*

While each of the five phases adds to and is predicated upon completion of the preceding phase, development could be suspended at the end of any phase. However, it must be emphasized that if construction is to be implemented efficiently and at minimum cost (regardless of when a given phase may be completed), designs and space allocations for Phases I through IV must be made before construction proceeds, as an integral part of the basic architectural plan.

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* NOTE: Initial project studies included an additional sub-phase (IV-B) which recommended designing a second theatre in the Center which could be readily equipped for the playback to large audiences of filmed or video taped presentations, recorded at the National Cultural Center or other such centers, together with art films, motion pictures of historical significance, and the like. Requirements called for a large-screen television system of the highest quality with a flexible stage design adaptable to wide screen film presentations such as Cinemascope, Todd American Optical, and perhaps Cinerama with the projection facilities to be installed by exhibitors as needed.

While the initial recommendation stands, this report will not attempt to provide detailed information on plans and costs for such an installation since studies by the architects in cooperation with various motion picture producers reportedly already are under way.

PHASE I--Space and Facilities for Occasional Broadcasting, Filming, and Recording by Outside Organizations

Provides space and facilities necessary for outside organizations to set up and operate portable equipment of their own in the Center.

Plans call for hidden camera locations, microphone placements, and control areas--for concealed color, monochrome and audio cable and cable conduits--for several sound-isolated announcer booths at the mezzanine level--for a master control area to house portable control equipment and network pooling facilities--for essential television lighting and air conditioning to permit broadcasting or recording from each of the three theatre stages, the foyer, salon, terrace, and entrance.

Color, monochrome and audio cable, connectors, and associated technical development	$150,000
Architect's estimate for additional construction, conduit, lighting, etc.	160,000
TOTAL PHASE I	$310,000

Phase I recommendations should be regarded as a minimum and basic aspect of Center construction with a design allowing for complete flexibility in the use of this equipment, easy access to conduits, circuitry and control areas, and provision for expansion.

PHASE II--Space and Equipment for Periodic Closed Circuit and Recording Activity as a Resident Function Within the Center

Provides space and equipment for audio and video closed circuit facilities and limited monaural and stereophonic audio recording capacity.

CCTV system to be used for monitoring critical performances, providing visual contacts between conductors and out-of-sight performers, to serve overflow audiences, and for security surveillance. Audio recorders provide for permanent record of special concert and operatic performances.

> Requirements call for hidden cameras, permanently mounted, and operated by remote control. Picture monitors would be located backstage, at checkpoints, in offices, and in other auditoriums (when overflow audiences were involved with a space allocation for large screen projection in one or more auditoriums.) System would feed the master control room where a switch would distribute pictures to the appropriate monitor receiver locations.

Vidicon cameras, interlocking synchronization, switching and control equipment, picture monitors, monaural-stereophonic audio tape recorders, microphones	$77,000
Architect's estimate for design, construction and installation	15,000
TOTAL PHASE II	$92,000

Staff to operate and maintain this installation could be engaged on an occasional basis or permanently employed. Need would vary with level of operation but a reasonable estimate would be two full-time people at a total of $16,000 per year.

PHASE III--Several Small Radio, Television and Film Studios for Frequent Broadcasting, Filming and Recording by Outside Organizations

Provides modest film, radio and television studio facilities for specialized and experimental production requiring controlled acoustical and lighting conditions in which outside organizations can set up and operate portable equipment of their own.

These facilities would make it possible to interview distinguished guests, to produce small-scale radio and television programs for broadcast or recorded release, and to undertake a certain amount of filming. When not otherwise employed the three studios could be used as general rehearsal areas and meeting rooms.

Lighting control equipment	$ 25,000
Architect's estimate for additional construction, acoustical treatment, and necessary non-electronic equipment	250,000
TOTAL PHASE III	$275,000

Phase III facilities could well become the nucleus of any systematic services to education which the Center may ultimately choose to develop.

PHASE IV--Dual Purpose Auditorium Stage for Occasional Use as a Major Television, Radio and Film Studio by Outside Organizations

Provides a large professional studio area in which major radio, film and television productions could be staged for nationwide broadcast, closed circuit or recorded distribution by outside organizations who can set up and operate portable equipment of their own.

Requirements call for at least one of the three auditorium stages to be designed for easy conversion into film, radio or television studio without impairing the appearance or affecting the use of the stage or the auditorium for regular performances.

This multi-purpose facility could be used as a conventional stage in the normal manner. However, performances could also be staged for the new media alone with no audience present or, on special occasions, broadcast or closed circuit transmissions could occur with audiences present in the auditorium but with emphasis on the radio or television presentation.

Plans call for employment of a number of new techniques in multi-purpose stage design involving such factors as variable acoustical wall treatment, mounting portions of the auditorium and orchestra pit on hydraulic elevators, and installing moveable light bridges, thus making it possible for broadcasting, film and recording organizations to install portable equipment on and/or adjacent to the stage and in control rooms overlooking the stage floor but invisible from the auditorium.

Architectural estimates, obtained from several sources for the design, construction, and installation of special, non-electronic equipment of such a multi-purpose facility range in cost from $750,000 to $1,500,000.

Since considerable experience in multi-purpose staging facilities is now available, when Center architects have stipulated the spatial area and completed a cost analysis based on a conventional treatment of one of the three stages, the additional cost can be readily developed.

Present estimated cost with 10% contingency $1,200,000

PHASE V--Center-Owned Equipment for Frequent Broadcasting, Filming and Recording from Facilities Already Established by a Resident Center Staff and Outside Organizations

Provides for permanent equipment and resident staff to administer, maintain and operate the entire Center film, radio and television program.

A core professional staff would employ the electronic media at the request of governmental agencies, educational broadcasting, commercial broadcasting, educational research, cultural and educational organizations, and foreign governments and on behalf of local Center operations. Services would be reimbursed accordingly. The resident facility would enable archival recording and retrieval capacity of Center events, an undertaking which, without permanent equipment and staff, would not be practically possible. It is the considered opinion of the authors that only with such a permanent facility can the educational establishment and the American public fully realize the benefits available in years to come from the Center.

Color and monochrome camera chains, switching system, audio and video recording, 16mm cameras, projectors, shop facilities, tubes and parts, etc.	$2,135,000
Architect's estimate for additional design and construction	100,000
TOTAL PHASE V	$2,235,000
TOTAL STAFF--PHASE V	$270,000 per year

One of the most important factors in the development of electronic gear is the trend towards miniaturization. Cameras, control equipment, switching systems, lighting panels, are now being designed in increasingly smaller packages thus making the installation of these devices in theatre and auditorium areas a much easier task for the planners. With other developments which greatly increase the light sensitivity of television picture tubes it will soon be possible to televise a conventional performance from the stage without either the audience or the performers being aware of any kind of mechanical intrusion.

Some scientists predict there will be a tenfold increase in the reliability of electronic devices over the next decade or two, with a significant decrease in the costs--as much as tenfold in some cases. Also, we can expect a hundred-fold decrease in size and bulk material requirements and a ten-fold decrease in power consumption. This trend toward miniaturization and lower costs is sure to have its impact on devices useful in education.

An even more important development from the standpoint of Center planners is the much greater reliability of equipment now emerging from laboratories and factories and its increased simplicity. In the predictable future there will be a great deal less need for skilled technicians either to maintain or to operate much of this equipment.

It should be made clear that many of the developments referred to above are already on production lines or soon to be production line products. In other words, we are not talking about a Jules Verne projection of what might be possible in some remote future, but rather describing devices which are now or soon will be available. Equally impressive are future possibilities being explored in electronic laboratories in this country and in Europe.

While the extent and scope of the foregoing recommendations may perhaps be construed by the Board of Trustees to be a drastic departure from the general concept of the Center and the planning based upon it, the experience of similar enterprises in this country and overseas makes it clear that some involvement with the various media of communication is inevitable.

It is understood certainly that the National Cultural Center's facilities are not intended to serve basically as a broadcasting studio, nevertheless the events which will take place in the Center will be of considerable interest to a wide public.

In this connection, it should be recalled that Congress intended the Center to be used both as a national performing arts center and as a place for civic occasions. The relationship between these two purposes can be especially close in the nation's capital where artistic performances and official receptions and occasions can be usefully blended.

These considerations, together with the growing national importance of all media of communications, suggest that Center planners must balance certain imperatives of present cost against future costs and an opportunity for decision which will not occur again.

APPENDIX I

THE NATIONAL CULTURAL CENTER ACT, THE SMITH REPORT AND THE MEDIA REVIEW PANEL

The National Cultural Center Act which became effective September 2, 1958, provided a splendid site for the Center on the Potomac River, but established responsibility for the building and the development of its program as a national obligation. The public was invited to contribute funds for the construction of the Center, this being the first time the Congress had ever given such an assignment to the nation.

Section 4 of the Act specifies that the Center is to

> "1. present classical and contemporary music, opera, drama, dance, and poetry from this and other countries,
>
> 2. present lectures and other programs,
>
> 3. develop programs . . . [for all age groups] in such arts designed specifically for their participation, education, and recreation, and
>
> 4. provide facilities for other civic activities . . . ."

Jarold A. Kieffer, now Executive Director of the National Cultural Center, early in 1959 saw the importance of the new media in helping to fulfill the functions described by the Congress and opened discussions on the subject with representatives of the United States Office of Education. Subsequently, as an NCC official he requested the report, What Goes Into the National Cultural Center, a document prepared by a committee headed by Carleton Sprague Smith, noted musicologist and consultant to the New York Public Library. This committee recommended that a study be made of the ways in which the educational value of the Center's various programs could be extended throughout

the country by the electronic media, and suggested that the cooperation of the Department of Health, Education and Welfare and the U. S. Office of Education be sought. Both of these agencies had demonstrated keen interest in the National Cultural Center.

The Smith report was approved in principle by the Center's Board of Trustees in late 1960 and a decision made to seek National Defense Education Act Title VII funds in order to study the possible roles of radio, television and related media. Accordingly, Jarold A. Kieffer, Executive Director of the National Cultural Center, and Richard B. Hull, Director of the Ohio State University Telecommunications Center, presented a plan which would:

1. Examine the existing and potential applications of the electronic communications media as they might apply to presentations of the performing arts within the Center, and to their dissemination, nationally and internationally, with particular reference to schools and institutions of higher learning in the United States.

2. Recommend the specific roles and functions of these media in realizing the immediate and long-range program requirements of the Center.

3. Determine the costs and technological considerations involved.

Because the Center was conceived as a national facility which would at once symbolize the official interest of the United States in the performing arts and would serve the growing cultural needs of the country, it was proposed to study:

1. Ways in which the new electronic media could provide National Cultural Center programs and materials to schools and to institutions of higher learning.

2. The responsibilities of the Center to discover creative talent and to foster and conduct workshops, institutes and advanced training programs in the new media for artists and performers.

3. The relationships to be maintained by the Center with both commercial and educational radio and television, nationally and internationally.

4. The radio and television relationships of the Center with various Federal and State agencies, such as the Voice of America, the Library of Congress, the U. S. Information Agency, and state departments of education.

5. The size and extent of new media facilities needed at the Center, including both space and equipment requirements.

6. The costs of building, staffing and operating these facilities.

Such information, it was hoped, would help the Center's Board of Trustees to develop long-term policy and also would prove useful to educational and civic cultural centers in various parts of the country, to the more than 275 educational television and radio stations, and to the state and regional educational networks now in operation, under construction, or in the planning stage.

On February 21, 1962, the Office of Education and the Board of Trustees announced that the Office, through contract provisions of Title VII of the National Defense Education Act, would make $27,969 available to the Center under subcontract arrangements with The Ohio State University Research Foundation and The Ohio State University Telecommunications Center. Starting date was January 22, 1962, with the study to terminate by December 31, 1962, although the latter date subsequently was extended until May 31, 1963 so that project personnel could work closely with the architects commissioned by the NCC Trustees.

An advisory Media Review Panel was appointed by the Center's board chairman, Roger L. Stevens, with the advice of the New Media Branch of the U. S. Office of Education. This panel, composed of seven senior figures selected from the performing arts, the communications industry, and education, assisted in the formulation of the study and its development, although the individual members do not necessarily subscribe to all the conclusions contained herein. However, the wide range of specialized knowledge which the members were able to bring to the study was invaluable. The thinking of the Panel resulted in an approach wherein the new media were construed as an

integral rather than peripheral aspect of the Center's work, and the program itself viewed as a continuously unfolding development whose requirements and opportunities would vary as the technologies it employed continued to evolve.

APPENDIX II

PROJECT VISITS IN THE U. S. AND ABROAD: CONSULTANTS AND ADVISORS

During this study members of the staff visited a wide range of institutions, firms and organizations related to education, the performing arts, broadcasting and equipment manufacture. The staff wishes to express sincere thanks to these many groups for their helpful interest, their ready understanding of the project's problems, their generous cooperation and valuable advice. A partial listing of the agencies and organizations consulted is given below:

Boston, Massachusetts--WGBH Educational Foundation

Camden, New Jersey--Radio Corporation of America

Chicago, Illinois--Chicago Educational Television Association (WTTW); Museum of Science & Industry; North Central Association of Colleges and Secondary Schools

Cleveland, Ohio--Cleveland Institute of Music; Cleveland Symphony Orchestra; Educational Television Association of Metropolitan Cleveland

Columbus, Ohio--Columbus Symphony Orchestra Association; International School of America; Ohio Educational Television Network Commission; Ohio State University

Lincoln, Nebraska--University of Nebraska

Miami, Florida--University of Miami Center for Audio Visual Instruction

Minneapolis, Minnesota--Minnesota Orchestral Association; University of Minnesota

New Haven, Connecticut--Yale University Department of Theatre Arts and Design

New York, N. Y.--American Broadcasting Company; Carnegie Hall Corporation; Columbia Broadcasting System; Lincoln Center for the

Performing Arts; National Broadcasting Company; National Educational Television and Radio Center; Edward Durrell Stone & Associates; United Nations Radio & Visual Service Division; Westinghouse Broadcasting Corporation

Norman, Oklahoma--University of Oklahoma Center for Continuing Education

Pleasantville, New York--General Precision Laboratories

Redwood City, California--Ampex Professional Products Company

Rochester, New York--Eastman Kodak Company

Syracuse, New York--General Electric Company

Washington, D.C.--American Council on Education; Broadcasting Station WRC-TV; Educational Media Branch, USOE; Cohn & Marks; Greater Washington Educational Television Association; Jansky & Bailey; Joint Council on Educational Broadcasting; Library of Congress; National Association of Educational Broadcasters; United States Information Agency

Although no project funds were allocated and none were used for international consultations, it was possible through other resources to gather data in several European countries. Project representatives were able to meet with officials of foreign radio and television organizations, visit studios, examine equipment, and discuss program policies and procedures. The following organizations were visited:

Frankfurt, West Germany--Hessische Rundfunk

London, England--BBC Broadcasting House and Television Center; Associated TeleVision

Paris, France--Radiodiffusion-Television Francaise; Mass Communication Techniques Division of UNESCO

Rome, Italy--Radiotelevisione Italiana; International Conference of Broadcasting Organizations on Sound and Television School Broadcasting

A partial list of individuals who have been helpful, in addition to the members of the Media Review Panel and the staffs of the United States

Office of Education and the National Cultural Center, is given below:

Martin Ackerman, Cultural Advisor, United States Information Agency, Washington, D. C.

Joseph E. Baudino, Vice President, Westinghouse Broadcasting, Inc., Washington, D. C.

Harold Boreiko, Specialist, Educational CCTV, General Electric Company, Syracuse, New York

Vernon Bronson, Director of Research and Development, National Association of Educational Broadcasters, Washington, D. C.

John R. Brugger, Technical Specialist, Educational Media Branch, U. S. Office of Education, Washington, D. C.

Sol Cornberg, Sol Cornberg Associates, New York, N. Y.

Jean d'Arcy, Director, Radio and Visual Service Division, United Nations, New York

Richard Daugherty, Specialist, Broadcast Equipment, General Electric Company, Syracuse, New York

Paige Donhauser, Edward Durrell Stone Associated, New York, N. Y.

Max Engele, Edward Durrell Stone Associates, New York, N. Y.

William H. Ewing, Associate Director, The Ohio State University Telecommunications Center, Columbus, Ohio

John Flory, Advisor on Non-Theatrical Films, Eastman Kodak Company, Rochester, New York

Frank N. Gillette, Associate Director of Engineering, GPL Division, General Precision, Inc., Pleasantville, New York

George H. Gordon, Chief Engineer, East Coast Division, Motion Picture Film Department, Eastman Kodak Company, New York, N. Y.

Zigmund Grobowsky, Consulting Engineer, Jansky & Bailey, Washington,D.C.

William G. Harley, President, National Association of Educational Broadcasters, Washington, D. C.

Theodore Hawryluck, Manager, Salary Administration, National Broadcasting Company, New York, N. Y.

Michael Hayward, Chief of Operations for Radio and Visual Services, United Nations, New York

Donald Horton, Director, Mershon Auditorium, The Ohio State University, Columbus, Ohio

George Izenour, The Drama School, Yale University, New Haven, Connecticut

G. W. Iler, National Sales Representative, Entertainment Markets, General Electric Company, Syracuse, New York

Daniel Lawler, Television Division, United States Information Agency, Washington, D. C.

Louis L. Lewis, Broadcast Marketing Department (Educational Electronics) Radio Corporation of America, Cherry Hill, New York

William B. Lodge, Vice President, Affiliate Relations and Engineering, Television Network Division, Columbia Broadcasting System, Inc., New York, N. Y.

Chalmers H. Marquis, Jr., Director of Programming, WTTW, Chicago, Illinois

Frank Marx, Vice President and President of Engineering, American Broadcasting Company, New York, N. Y.

Robert Miner, Product Manager, Ampex Professional Products Company, Redwood City, California

Richard S. O'Brian, Director Audio and Video Engineering, TV Network Division, Columbia Broadcasting System, Inc., New York, N.Y.

Lewis Page, District Sales Manager, Broadcast Equipment Division, General Electric Company, New York, N. Y.

Walter R. Pierson, Manager Plant, Facilities, Planning, TV Network Division, Columbia Broadcasting System, Inc., New York, N.Y.

Edward L. Sacks, Vice President of Operations, TV Network Division, Columbia Broadcasting System, Inc., New York, N. Y.

George Sebastian, Broadcast Equipment Sales, Radio Corporation of America, New York, N. Y.

Harry E. Smith, Manager of Marketing, Technical Products, General Electric Company

Seth Spaulding, Chief Educational Materials and Services Section, U.S. Office of Education, Washington, D. C.

Edward Stanley, Director of Public Affairs, National Broadcasting Company, New York, N. Y.

Frank Stanton, President, Columbia Broadcasting System, Inc., New York, N. Y.

David Stewart, Executive Secretary, Joint Council on Educational Broadcasting, Washington, D. C.

Adrian TerLouw, Educational Consultant, Eastman Kodak Company, Rochester, New York

W. H. Trevarthen, Vice President Operations and Engineering, TV Network Division, National Broadcasting Company, New York, N. Y.

Paul H. Wagner, Consultant, Professor of Journalism, Ohio University, Athens, Ohio

Robert W. Wagner, Director, Motion Picture Division, Department of Photography, Ohio State University, Columbus, Ohio

Edward Waters, Assistant Chief, Music Division, Library of Congress, Washington, D. C.

Lawrence Weiland, Manager, Video Products, Ampex Professional Products Company, Redwood City, California

John Wentworth, Manager of Educational Electronics, Radio Corporation of America, Cherry Hill, New Jersey

APPENDIX III

BUILDING DESIGN, NEW MEDIA EQUIPMENT AND STAFF

This appendix provides detailed information concerning space requirements, equipment, facilities, staffing and costs for electronic, film and other audio-visual media for the National Cultural Center.

Regardless of the level of communications media development finally determined, several factors should be observed:

1. All media equipment should be of the latest design and highest professional caliber.

2. Provision should be made for both color and monochrome television origination.

3. A certain amount of customizing of equipment may be expected.

4. Flexibility should be a major consideration in the selection of equipment and the design of space in order to permit easy modification as improvements in electronic and film devices occur.

5. Some attention should be given to electronic and film standards in European and other countries in the design and selection of equipment.

6. Center planners should benefit from the experiences of the national broadcasting networks with the Lincoln Center for the Performing Arts. The three networks have spent long hours rectifying and improving origination facilities in this new structure.

There are several levels of sophistication possible in the use of the new media in the NCC which are described in the phases that follow. Each provides a certain flexibility and capability for extending the benefits and influence of the NCC to the students and adults of America. Each additional phase of development adds to and is dependent upon the preceding. Selection is obviously dependent upon funds available.

PHASE I

Provision for hidden camera locations, microphone placements, and necessary technical equipment in the basic building design in such a manner as to enable importation of remote equipment and crew for broadcast of performance from each of the three theatres and from strategic foyer, salon, terrace, roof and entrance locations without disruption of local performance, without marring local decor, and without inconvenience to resident audiences.

For radio and television commentation, two or more sound-isolated booths at mezzanine level and overlooking each of the three presentational areas.

Provision for room housing master control and network pooling facilities with hidden conduit from each camera and microphone location terminating here thus eliminating necessity of parking remote broadcast van adjacent to building and stringing cables throughout theatres. Exact camera and microphone locations for each of the three theatres should be determined by the recommended communications media advisory committee. To allow for complete flexibility of use, easy access and future growth, broadcast consultants recommend the incorporation of access panels and ducts in basic NCC design.

Additional space requirement for master control:	900 sq. ft.
Color and monochrome and audio cable, connectors and associated development for camera and microphone positions throughout the building	$150,000
Architect's estimate for additional design, construction, conduit, air conditioning, power and theatre lighting to enable color origination	160,000
ADDITIONAL COST, PHASE I	$310,000

PHASE II

Provision of closed circuit audio and video facilities for use in NCC activities, for performance improvement, for observation, for monitoring critical operations, for traffic, lighting and musical control, and for security surveillance. Camera positions would be hidden; cameras would reside on permanent mounts and operate by remote control. Monitors could be located backstage, at checkpoints, in offices and whatever other strategic locations were deemed necessary. The system would feed to the master control room where a switching system would distribute pictures from various cameras located in the theatres and halls to the appropriate monitors. Audio recorders would provide for permanent record of special concert and operatic performances.

Vidicon cameras, interlocking synchronization, multiple switching and control, monitors, monaural-stereophonic tape recorders, microphones	$ 77,000
Architect's estimate for additional design, construction, conduit and related expense	15,000
ADDITIONAL COST, PHASE II	$ 92,000

Staff to operate and maintain this installation could be engaged on an occasional basis or permanently employed. Need would vary with level of operation but a reasonable estimate would be a total of $16,000 per year.

PHASE III

Provision of modest radio and television studio facilities for specialized and experimental productions requiring optimum conditions for broadcasting and recording. In addition to the facilities provided in earlier phases, small radio and television studios would be included in the building design. Networks and production agencies would import remote equipment but work in ideal conditions for broadcast performance and film recording. Important personages could be interviewed in private. Facilities could be used concurrent with rehearsal and performance.

The television studio could double as a film recording and still photography studio and as a rehearsal hall for NCC non-communications activities.

Additional space requirements:		
Two television-film studios (2400 sq. ft. each, 20' height, two parking levels)	4,800	sq. ft.
Two television program control rooms (300 sq.ft.)	600	
Two television audio control and booth (150 sq.ft.)	300	
Radio studio	300	
Radio control and booth	120	
Total	6,120	sq. ft.
Lighting control equipment	$25,000	
Architect's estimates for additional construction, acoustical treatment and necessary non-electronic equipment	250,000	
ADDITIONAL COST, PHASE III	$275,000	

PHASE IV

Provision of such design, construction and equipment to enable the conversion of one of the three presentational theatres for optimum broadcast production, again without impairing resident performance, decor or audience. The theatre would employ the latest conversion and dual use techniques to permit quality performance before a local audience and maximum use of the facility for radio and television production during those times when the primary audience is the broadcast audience. In this manner, commercial and educational producers could import broadcast equipment and crews to adapt large scale multi-set and cast NCC performances to the broadcasting arts and create special complex productions particularly for the broadcast media.

No additional space requirements.

Architect's estimate for additional design, construction and equipment to enable theatre/studio conversion	$1,200,000

PHASE V

Provision for permanent equipment and resident staff to administer, maintain and operate the entire NCC communications media program. A core professional staff would employ the electronic media at the request of governmental agencies, educational broadcasting, commercial broadcasting, educational research, cultural and educational organizations and foreign governments and on behalf of local NCC operations. Services would be reimbursed accordingly. The resident facility would enable archival recording and retrieval of NCC events; without permanent equipment and staff, in practical terms, such would not be possible.

It is the considered opinion of the authors that only with such a permanent facility can American education fully realize the extensive benefits available in coming years from the NCC.

Additional space requirements:	
Telecine room	300 sq. ft.
Recording room	500
Storage	1,200
Technical shop	150
Graphics/photo workroom and darkroom	600
Screening and conference rooms	240
Offices for staff and transient producers	1,040
Tape-film editing area (four rooms 6 x 12, one room 8 x 16)	416
Two projection rooms with projection booth	780
Materials mailing center	200
Total	5,426 sq. ft.

Additional equipment requirements:	
6 color camera chains	$360,000
4 monochrome camera chains	100,000
Switching system	80,000
Terminal equipment	40,000
Television audio	18,000
Telecine	80,000
Recording equipment: 2 color video, 2 audio, 1 film, 1 film processor	191,000
Radio studio & control	8,000
Shop facilities & test	10,000
Tubes & parts	50,000
Shipping & installation	100,000
3 arc projectors, 35mm professional type; anamorphic lenses; 2 16mm arc projectors and projection facilities for 2 x 2 and 3 1/4 x 4 inch slides	50,000
2 16mm motion picture cameras with dollies and associated equipment	15,000
16mm magnetic film recording and re-recording system, film recorder for optical track transfers	25,000
Assorted audio-visual presentation devices	8,000
	$1,135,000

Architect's estimate for additional design and construction	100,000
ADDITIONAL COST, PHASE V	$1,235,000

It should be noted that the total additional space required to activate all phases of the electronic-film media development amount to only 12,446 square feet--approximately 3% of the total floor space of one floor of the Center.

Staff and Operations

If the complete electronic and film equipment installations described in Phase V above were to be made, there obviously would have to be a resident staff to operate it. Phases I, III and IV would require at least one full or part-time staff member to serve as liaison officer with those outside organizations doing broadcasting within the Center. Phase II, depending on the frequency and amount of useage, could probably be operated with occasional part-time help, or two full-time people at an annual cost of $16,000.

The personnel roster given below based on extensive conversations with broadcast network officials, film experts and a review of Civil Service pay scales, assumes a fairly extensive operational schedule, utilizing all of the equipment listed under Phase V:

1 Executive Officer
1 Chief Engineer
1 Producer-Director
1 Studio Supervisor/Technical Director
3 Camera Operators
2 Recording Technicians
1 Telecine Operator
1 Audio Technician
1 Master Control Technician
2 Video Operators
1 Floor Manager/Production Assistant
2 Secretary/receptionists
1 Lighting Director
1 Announcer/Talent
1 Bookkeeper/Accountant

2 Graphics/Photographics Specialist
1 Still Photographer
1 Motion Picture Specialist
1 Audio-Visual Media Specialist
1 Editorial Supervisor

Total annual salaries, including employee benefits $270,000

A Permanent Technical Advisory Team for the Center

On November 30, 1962, the authors met in New York with the engineering vice presidents of the American Broadcasting Company, the Columbia Broadcasting System, the National Broadcasting Company, the president of Sol Cornberg Associates, representatives of Ampex, Eastman Kodak, General Electric and Radio Corporation of America, and with Edward Durrell Stone, architects.

This meeting provided valuable counsel as did visits to the laboratories of equipment manufacturers.

This group of men were the prototype of what might well be a permanent technical advisory group for the Center.

Such a committee is strongly advised for it can provide invaluable service to the architects, builders and Trustees of the Center, regardless of the level of electronic media development finally determined.

The Necessity for Immediate Policy Decisions

While the extent and scope of the foregoing recommendations may be construed by the Board of Trustees to be a drastic departure from the general concept of the Center and the planning based upon it, the experience of similar enterprises in this country and overseas makes it clear that some involvement with the various media of communication is inevitable.

It is clear certainly that the National Cultural Center's facilities are not intended to serve basically as broadcasting studios, nevertheless, the events which will take place in the Center will be of considerable interest to a wide public.

In this connection, it should be recalled that Congress intended the Center to be used both as a national performing arts center and as a place for civic occasions. The relationship between these two purposes can be especially close in the Nation's Capital where artistic performances and official receptions and occasions can be usefully blended.

These considerations together with the growing national importance of all media of communications suggest certain imperatives of cost and opportunity to Center planners. If some of the roles of the media are anticipated at the outset and incorporated into Center plans for construction and operation, a great deal of money can be saved. If, on the other hand, these situations are dealt with on an emergency basis after the fact, the costs involved may be enormous and the results much less satisfactory.

Note: Initial project studies included an additional sub-phase (IV-B) which recommended designing a second theatre in the Center which could be readily equipped for the playback to large audiences of filmed or video taped presentations recorded at the National Cultural Center or other such centers, together with art films, motion pictures of historical significance, and the like. Requirements called for a large-screen television system of the highest quality with a flexible stage design adaptable to wide-screen film presentations such as Cinemascope, Todd American Optical, and perhaps Cinerama, with the projection facilities to be installed by exhibitors as needed.

While the initial recommendation stands, this report will not attempt to provide detailed information on plans and costs for such an installation since studies by the architects in cooperation with various motion picture producers reportedly already are underway.

APPENDIX IV.

THE NON-ELECTRONIC MEDIA IN THE NATIONAL CULTURAL CENTER*

--Robert W. Wagner

Dr. Wagner, Professor in the Department of Photography and Director of the Motion Picture Division at Ohio State University, is recognized internationally for his creative skill as a producer of educational films and as a leader in the philosophy of educational communications. The authors of this report have relied heavily on his suggestions in their final recommendations.

While the electronic media described in Appendix III--television, radio and video tape-- are the primary means of program transmission, care should be taken to sufficiently emphasize other forms of the so-called "new media" which necessarily supplement, complement, or in some cases, must be considered as important forms distinctive from the electronic media.

If the concept of "A National Cultural Center" matures in its broadest sense and is not limited to transmission of "the performing arts"--theatre, opera, ballet and symphony--but is also conceived to include the fine and graphic arts, the motion picture and other cultural expressions, a necessary enrichment of the Center's program, both internal and transmitted, necessitates detailed consideration of the use of all the new media in this program.

Both the creation and the transmission of ideas and expressions of culture depend increasingly on the tools at hand and the Center should make these technological instruments for the production and dissemination of audio-visual imagery available. The Center should become a model of the multiple use of the new media of communication, particularly if the Center is to become a

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* Editor's Note: This Appendix is a highly condensed version of a more detailed study which included equipment descriptions, prices, etc.

place of study, experimental production, an archive, and a show-place of important aspects of the American cultural heritage.

What have here been described as "the non-electronic media" may appear to be peripheral in terms of "the performing arts" concept of the Center. But they are central in the packaging and dissemination of program materials at home and abroad; in the development of a creative research and study program for the Center; and in the design of the Center itself, including exhibit areas, public information programs, and the storage and retrieval of Center-originated materials.

The following recommendations for "non-electronic media" parallel the several levels of sophistication described in Appendix III. In all phases, the necessary and desirable integration of electronic and non-electronic equipment, space, and personnel is noted. At certain points, non-electronic media facilities are mentioned separately where such separation seems to be economically necessary or functionally desirable, and always consistent with the broader concept of a National Cultural Center as described in its prospectus.

PHASE I

Provisions for hidden camera locations should include both film and television camera stations since many companies will prefer to film a performance rather than tape it. While tape is replacing live programming, film programming for television has continued to increase. In 1963, film occupies 35% of the national TV day and dominates the prime time offerings of all networks.* Other types of recording systems must also be recognized along with the possibility that some occasions may arise when an organization may wish to record only fragments of a performance.

* Broadcasting Yearbook.

At the same time, consideration should be given to the installation of electronicam camera systems capable of multiplexing the image to: (1) a direct on-the-air transmission; (2) directly to a 16mm or 35mm film chamber; (3) diverted to a video tape recorder; (4) diverted to a conventional kinescope recorder; (5) diverted to thermoplastic or other yet-to-be developed recording media.*

At the moment, such thinking does not change the space or basic cable and connector costs mentioned for Phase I in Appendix III.

PHASE II

Provision for closed circuit audio and video facilities mentioned should desirably be integrated with the "visual wall" concept in areas where visitor or study conditions exist. This means architecturally designing closed circuit receivers along with provisions for rear-screen projection of films, slides and other multiple-image and audio signals as part of a total viewing situation, making it possible to multiplex these in the same location, with control panels located at the equivalent of the lectern position.

While all of these forms might, and in some cases will be reduced to the common denominator of video tape, the "visual wall" concept has certain advantages of flexibility of size, shape, mixtures of color and black and white, local control of image, rapid repeating, and adjustable pacing.

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* These multiple recording channels and methods are suggested because they present alternative cost, storage and transmission methods. The use of film eliminates the problems of overseas use as far as variable electronic standards and TV scanning systems are concerned; make possible dissemination of programs on the nation's 150,000 or more 16mm in-school projectors; and simplifies the use of stored program materials in the Center itself by students, research workers and artists who can view the program in a small conventional film projection room or on a self-threading or cartridge rear-screen projector in carrel.

No additional space or equipment needed here, only the architect and planners' conception of extended use of the closed circuit system to areas where a "visual wall" might be developed as the Center plan matures.*

PHASE III

There is no doubt that studio design for film and television can be compatible. Operationally, however, film, television and still photographic operations scheduled into the same space raises logistic problems when such space is intended "for specialized and experimental productions requiring optimum conditions for broadcasting and recording."

Thus the provision for two smaller film-TV studios is more desirable than one large one; likewise, a small studio for still photography should be separated from the film-television studios. Film is a stop-and-go operation; it usually involves floor lights; standing sets. There should be provisions for extended use of the space for the kind of rehearsal and polishing time not generally possible in commercial or even in educational television and film making.

The total floor space of 8000 sq. ft. allowed for these studios is minimal. The student film studios of two major universities exceeds this footage by many thousands of feet.

PHASE IV

The conversion of one of three presentational theatres for optimum broadcast production purposes should be paralleled with the conversion of a second theatre with playback or presentation primarily in mind. This should include: (1) a large-screen television system of highest quality at the time

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* The Charles Eames "visual wall" could serve as a prototype here along with that at the University of Wisconsin and the New Media Center at the University of Miami in Florida.

Phase II is put into effect; (2) flexible stage design adaptable to wide-screen film presentation; (3) provisions for multi-speaker stereo sound system for multi-take track visual presentations; (4) a projection booth and equipment capable of housing three quality arc projectors, two 16mm motion picture projectors, together with slide projection facilities.

PHASE V

Provision for permanent equipment and resident staff is an absolute necessity if the Center is to become a truly national cultural shrine where the public and the artist alike can find inspiration.

It is in this area that the non-electronic media will play an important role. Up to this point we have been in process of developing a shell for display of the performing arts and a system for displaying these arts on a wide scale by direct television transmission or delayed on tape, and possibly on film.

At this point we begin to develop creative programs within the Center; to encourage the artist-in-residence; to inspire the public who comes to visit; to especially cater to the youth of the nation, and help them see "culture" as part of (not apart from) their own lifestream; and to package and distribute excellent examples of our culture (not to exclude the fine and graphic arts, photography and motion pictures) for local, long-time distribution in communities at home and abroad.

The stated objectives of the Center and its purpose of "awakening and advancing our artistic, creative and cultural development" on a national and international dimension necessitates facilities for creative experimentation, production and exhibition within the Center. This is more than an extension of theatre; more than a Washington D.C. counterpart of New York's Lincoln Center.

Phase V should include space for: (1) a tape-film editing area; (2) two projection rooms; (3) a graphics workshop; (4) photographic darkroom; and (5) materials packaging and distribution center.

Additional equipment requirements will include: (1) three 16mm motion picture cameras; (2) a 16mm magnetic film recording and re-recording (mixing) system and film recorder for optical track transfers for translating materials into foreign language versions for overseas use, and (3) editing equipment for 16mm, 35mm and video tape.*

A complement of necessary audio-visual presentation devices to be used for self-instructional, experimental, public exhibit, and educational purposes in the Center itself. These will depend upon the nature of the development of new media at the time when this phase of the development is reached. However, the equipment will doubtless include some form of the following technological devices: (1) equipment for the projection of static transparencies; (2) equipment for the display of still photographs, works of art, traveling exhibits contributing to an understanding and appreciation of our cultural heritage, etc., including special movable exhibit hangers, lighting and associated exhibit devices such as message repeaters, short-wave tape systems and earphones for electronically controlled guided tours, etc,; and (3) the development of a system of carrels in conjunction with the distribution center mentioned earlier so that programs on 16mm film (and possibly 8mm sound film in the immediate future), audio tape or via closed circuit television

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* The "film processor" mentioned in Appendix III is, from a practical point of view a questionable investment for the Center. Good processing laboratories exist in the Washington area; most film producers would prefer to work to the standards of their own laboratories from which their exposure indexes are taken; and unless there is a continuing very high volume of work, the equipment would be operable only at an inefficient, costly and unreliable quality basis. This would cancel out approximately $5,000-$10,000 which could be more usefully expended on extending the dubbing and re-recording facilities mentioned above as essential for the translation of packaged materials for foreign transmission.

transmission may be selected and programmed automatically in "juke-box" style for qualified individuals just as they might select and use materials in carrels in a good library.

Staff and Operations

With reference to staff, while this is a requirement presently found in the final stage of the development of the Center, it would seem highly desirable to enlist a highly competent, professional core-staff composed of television, film, graphics and audio-visual media specialists at an earlier stage, sensibly responsible for developing and coordinating the details of the design of the Center in relation to specific purposes. There are abundant examples of technological wonders left standing without the hands to man the ship. The Center eventually will be only as good as the handful of professionals who finally make it operational.

APPENDIX V

THE NECESSITY OF ADEQUATE SYSTEMS AND ALLOCATIONS STANDARDS FOR THE CCTV DISTRIBUTION OF NATIONAL CULTURAL CENTER PRODUCTIONS

--C. M. Jansky, Jr.

Dr. C. M. Jansky, Jr., built the equipment for the nation's pioneer radio station, WHA, at the University of Wisconsin, and engineered the first statewide educational FM network in that state. At the University of Minnesota he established the first curriculum in electronic communication. Internationally recognized for his commercial consulting work and his prophetic vision with respect to new electronic developments, he has maintained a constant interest in cultural and educational broadcasting, marked by concern for improvement of standards.

If the National Cultural Center is to be truly "national", then dramatic, musical and other productions at the Center must be carried to other cultural centers throughout the nation. This can be done on a delayed time basis by several ways such as, for instance, by the use of motion picture films or by video tape. However, it is logical to conclude that the basic requirement will be for the simultaneous distribution of programs by closed circuit television (CCTV) techniques and also that major emphasis will be on group reception of programs at cultural centers throughout the entire United States. (Closed circuit television involves the dissemination of television programs over cables, microwave relay systems and other facilities without the use of standard television broadcast facilities or channels.)

If there is to be simultaneous closed circuit dissemination of programs to cultural centers throughout the United States, then the basic equipment and systems standards which are to be applied become matters of prime importance.

Because of the characteristics of present equipment and a natural inclination to view the requirements for closed circuit television in the light of past experience with television broadcasting, there is a strong tendency to merely transfer and apply commercial television standards to the new and rapidly expanding closed circuit television field. Unfortunately, television broadcast technical and allocation standards are entirely inadequate for the closed circuit distribution of National Cultural Center productions to other centers, that is, if sound and picture quality and fidelity are to be such as to attract sustained interest.

Obviously, dramatic and musical productions worthy of the National Cultural Center will be of the highest caliber. Otherwise, there would be no justification for the Center. When NCC productions are carried simultaneously to other centers throughout the United States, the same high standards of quality and fidelity must be preserved. This will call for large screen presentations in full color as good or better in quality than the Cinemascope, Todd American Optical or Cinerama picture systems together with high fidelity, stereophonic sound. Unless these requirements are met, National Cultural Center productions will not command sustained interest throughout the United States.

It is submitted that if the Center is to be a "national" success then these video and sound closed circuit and presentation requirements must be met. The state of the art is such that either they can be met today or within the next three to five years. However, if present limited television broadcast standards are accepted and approved for closed circuit television and network interconnection, then it is highly probable, if not certain, that opportunity will be forever lost to establish closed circuit systems capable of meeting Center requirements as well as the requirements for certain types of educational television programs.

It is not the purpose of these comments to disparage television broadcast and network interconnection standards. Many factors and compromises entered into their determination. They are adequate for the delivery of picture and sound programs to most home television receiving sets. They are not adequate for the dissemination of cultural and certain types of educational programs in the future.

It is neither feasible nor appropriate at this time to make a detailed comparison of the technicai standards for television broadcasting and those necessary for large screen closed circuit television presentations of the quality described above. However, some brief comparisons may be in order. Television broadcasting in the United States is limited to a 525 line picture. High quality closed circuit television may require at least 625 lines or even more.

The standard channel width for television broadcasting (including the accompanying audio portions of the program) is 6 megacycles (6000 kilocycles). It must be recognized that if high quality pictures and high fidelity sound are to be disseminated over any closed circuit networks, a much wider channel width must be provided. How wide the channel width must be depends upon the technical standards found necessary to provide a large screen presentation with high fidelity sound which will command a sustained interest on the part of the audience.

If Center programs are to be transmitted in color, then it will become necessary to consider the adequacy of the present television broadcast color system. The requirements for large screen color presentations may well be quite different from those applicable to home reception. It is not necessary to transfer the standard broadcast color system to closed circuit television. There may well be other systems which are better.

The above are just two examples which illustrate the necessity of establishing requirements for closed circuit television distribution systems without regard to the compromises and limitations it has been necessary to adopt in building a television broadcast system which must of necessity accommodate a large number of commercial and non-commercial stations. Unless advantage is taken of the full capabilities of closed circuit television by establishing technical and allocation standards which take advantage of the latest advances of the electronic art the future potentialities of the National Cultural Center and of educational television will prove to be severely limited.